Claims

1. A process for the treatment of dust- and oxygen-containing exhaust gases, which contain sulfur oxides and nitrogen oxides, at temperatures in the range from 200°C to 500°C by means of reducing agents in a reactor (19) which is equipped with solid catalyst (20) with flow passages, in which the free opening surface of the catalyst (20) is more than 50 % and in which the passages of the catalyst (20) have a hydraulic diameter of more than 2 mm, characterized in that

   a) the treatment in the reactor (19) is performed in the presence of and/or with the addition of one or more substances selected from free oxides, carbonates, hydroxides of calcium, magnesium, sodium and potassium,

   b) during the treatment, the operating conditions of the gas flow in the free reaction space are adjusted corresponding to the Froude numbers in the range of

$$1 \leq 3/4 \cdot \frac{\mu^2}{g \cdot d_k} \cdot \frac{\rho_g}{\rho_k - \rho_g} \leq 100$$

   with

$$\frac{\mu^2}{g \cdot d_k} = Fr^2 \ .$$

2. The process as claimed in claim 1, characterized in that in the reactor (19) honeycomb and/or plate catalysts (20) are used, which beside titanium dioxide and tungsten contain more than 0.5 wt-%, preferably 2-8 wt-%, vanadium pentoxide.

3. The process as claimed in any of claims 1 and 2, characterized in that the treatment is performed in the presence of and/or with the addition of one or more substances selected from free oxides, carbonates, hydroxides of calcium, magnesium, sodium and potassium with an average particle size d_{50} between 5 µm and 100 µm.

4. The process as claimed in any of claims 1 to 3, characterized in that the treatment of the exhaust gas is preferably performed in the presence of and/or with the addition of one or more substances selected from free oxides, carbonates, hydroxides of calcium.

5. The process as claimed in any of claims 1 to 4, characterized in that as reducing agent there are used NH_3-releasing compounds such as $(NH_4)_2SO_4$, $(NH_4)_2CO_3$, $(NH_4)HCO_3$, $(COONH_3)_2H_2O$, $HCOONH_4$, NH_3, NH_4OH, H_2O-CO-NH_2, NH_2CN, $Ca(CN)_2$, NaOCN, $C_2H_4N_4$, $C_3H_6N_6$ and NH_3-containing waste waters from photochemical plants, singly or several of them.

6. The process as claimed in claim 5, characterized in that before entry of the exhaust gases in the reactor (19), the NH_3-releasing compounds are incorporated in the flue gas stream in the gaseous, liquid or solid condition at temperatures in the range between 200°C and 1000°C.

7. The process as claimed in any of claims 5 and 6, characterized in that the NH_3-releasing compounds are incorporated in the flue gas stream in the form of dilute aqueous solutions at temperatures in the range between 300°C and 550°C.

8. The process as claimed in any of claims 1 to 7, characterized in that the presence or the addition of one or more substances selected from free oxides, carbonates, hydroxides of calcium, magnesium, sodium and potassium to the flue gas stream preferably is effected before the use of NH_3-releasing compounds.

9. The process as claimed in any of claims 1 to 8, characterized in that the flow to the reactor (19) equipped with the catalyst (20) is effected from above or from below.

10. The process as claimed in any of claims 1 to 9, characterized in that the flow to the reactor (19) equipped with the catalyst (20) is effected alternately from above and from below.

11. The process as claimed in any of claims 1 to 10, characterized in that beside the breakdown of sulfur oxides and nitrogen oxides, the reactor (19) equipped with the catalyst (20) is at the same time used for the breakdown of halogen compounds, halogenated organic compounds, hydrocarbons and CO.

12. The process as claimed in any of claims 1 to 11, characterized in that the reactor (19) equipped with the catalyst (20) is used for the breakdown of sulfur oxides and nitrogen oxides in dust-laden exhaust gases in the chemical and metallurgical industries as well as in the cement and lime industries, in power plants and in garbage incineration plants in the process flow at temperatures in the range between 200°C and 500°C without additional preheating of the exhaust gas.

13. An apparatus for the treatment of dust- and oxygen-containing exhaust gases of a cement factory, which exhaust gases contain sulfur oxides and nitrogen oxides, characterized in that the reactor (19) equipped with catalyst (20) is disposed in the exhaust gas stream behind the cyclone heat exchanger (13) (and before the raw material grinder (21) and before the bypass I to the evaporative cooler (22)).

14. The apparatus as claimed in claim 13, characterized in that the addition of NH_3-releasing compounds to the heat exchanger preferably is effected in the vicinity of the raw meal addition (12) and/or shortly behind the raw meal addition (12), preferably before the last cyclone (Z1).

15. An apparatus for the treatment of dust- and oxygen-containing exhaust gases of a power plant, which exhaust gases contain sulfur oxides and nitrogen oxides as well as halogen compounds, halogenated organic compounds, hydrocarbons and CO, as claimed in any of claims 1 to 12, characterized in that the reactor (19) equipped with catalyst (20) is disposed in the exhaust gas stream behind the boiler (27) and before the air preheater (26).

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List of Reference Numbers

A	metering point	unchanged
B	metering point	
C	metering point	
D	metering point	
E	metering point	
F	line	new - by avoiding double usage for various elements
G	line	
H	line	
I	line	
J	line	
K	line	
M1	flap	modified and "M" extracted from the circle symbols acc. to 37 CFR 1.84
M2	flap	
M3	flap	
M4	flap	
M5	flap	
M6	flap	
M7	flap	
M8	flap	
M9	flap	
M10	flap	
M11	flap	

12	raw meal addition	new reference numbers instead of legends in the priority drawings
13	cyclone heat exchanger	
14	---	
15	---	
16	rotary kiln	
17	---	
18	dust blower	
19	SCR reactor	
20	catalyst modules	
21	raw material grinder	
22	evaporative cooler	
23	dedusting means	
24	chimney	
25	WT blower	
26	air preheater	
27	boiler	
28	additives	
29	reducing agent	

Note:
All corrections in the drawings and the claims were executed without including any "new matter" according to 35 U.S.C. 113 ff.